

**CLEAN VERSION OF AMENDMENTS**

Please amend claims 1, 12-13, 20-21 and 23 to read as follows:

1. (amended) A multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

- a is from 0.3 to 1.9 and
- b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and
- c is from 0 to 20 and
- x is a number determined by the valence and amount of elements different from oxygen in the formula I,

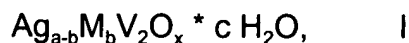
which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

12. (amended) A process for producing precatalysts and catalysts for the gas-phase partial oxidation of aromatic hydrocarbons, comprising, in a first step, coating an inert, nonporous support material with one or more layers comprising a multimetal oxide as claimed in claim 1, in the form of a shell, and in an optional second step, thermally treating the coated support material at a temperature of from greater than 200 to

650°C.

13. (amended) A precatalyst for producing coated catalysts for the gas-phase partial oxidation of aromatic hydrocarbons by means of a gas comprising molecular oxygen, comprising an inert, nonporous support material and one or more layers applied thereto in the form of a shell or shells, wherein this/these shell-like layer or layers comprises/comprise a multimetal oxide as claimed in claim 1.

20. (twice amended) A coated catalyst as claimed in claim 19 which has been produced using a multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

a is from 0.3 to 1.9 and

b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and

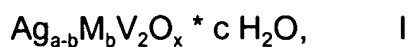
c is from 0 to 20 and

x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,

$3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

21. (twice amended) A coated catalyst as claimed in claim 19 which has been produced from a precatalyst comprising an inert, nonporous support material and one or more layers applied thereto in the form of a shell or shells, wherein this/these shell-like layer or layers comprises/comprise a multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

a is from 0.3 to 1.9 and

b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and

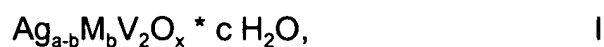
c is from 0 to 20 and

x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

23. (amended) A process as claimed in claim 22, wherein use is made of a coated catalyst whose catalytically active composition, based on its total weight,

comprises from 30 to 100% by weight of a silver-vanadium oxide bronze having an Ag:V atomic ratio of from 0.15 to 0.95 and has a BET surface area of from 2 to 100 m<sup>2</sup>/g and which has been produced in situ in the oxidation reactor from a precatalyst comprising an inert, nonporous support material and one or more layers applied thereto in the form of a shell or shells, wherein this/these shell-like layer or layers comprises/comprise a multimetal oxide of the formula I



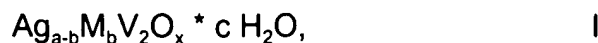
where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

- a is from 0.3 to 1.9 and
- b is from 0 to 0.5, with the proviso that the difference (a–b) is greater than or equal to 0.1 and
- c is from 0 to 20 and
- x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

Please introduce new claims 27 to 30, which read as follows:

27. (newly added) A process as claimed in claim 22, wherein the first coated catalyst has been produced using a multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

a is from 0.3 to 1.9 and

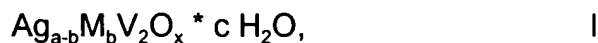
b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and

c is from 0 to 20 and

x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

28. (newly added) A process as claimed in claim 24, wherein the coated catalyst used in the first catalyst bed has been produced using a multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

- a is from 0.3 to 1.9 and
- b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and
- c is from 0 to 20 and
- x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings  $d$  of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

29. (newly added) A process as claimed in claim 27, wherein, as aromatic hydrocarbons, o-xylene or naphthalene or mixtures of o-xylene and naphthalene are oxidized to phthalic anhydride.

30. (newly added) A process as claimed in claim 27, wherein, as aromatic hydrocarbon, toluene is oxidized to benzoic acid.

### REMARKS

Applicants have amended herein claims 1, 12-13, 20-21 and 23. These amendments correct typographical errors, and place the claims in proper form for US national phase prosecution. Claims 27-30 are newly added, and incorporate the elements of claim 1 into claims 22 and 24-26.

### UNITY OF INVENTION

The present claims exhibit unity of invention. Unity of invention is present where independent claims of an invention form a single general inventive concept through a technical relationship involving one or more special technical features (PCT Rule 13; 37 CFR §1.475).

The independent claims in the present invention are claims 1, 9, 12, 19 and 22. Independent claims are defined as those claims which do not contain all features of another claim, or are not in the same category as the claim from which they depend (PCT Annex B(1)(c)). Claim 1 recites a multimetal oxide, claim 9 recites a process for preparing this oxide, and claim 12 recites a process for using this oxide. Claim 19 is drawn to a coated catalyst which can be produced using the multimetal oxide of claim 1, and claim 22 recites a process for using this coated catalyst.

These independent claims form a single general inventive concept through the multimetal oxide and the silver-vanadium oxide coating on the claimed catalyst. Unity of invention is present between intermediate and final products where these have the

same essential structural element and where the final product is manufactured directly from the intermediate (PCT Annex B(1)(g)). Thermal treatment of the claimed multimetal oxide leads *directly* to the silver-vanadium oxide described in claims 19 and 22. The claimed multimetal oxide and the silver-vanadium oxide produced therefrom are two special technical features that define the present invention over the prior art. Accordingly, the technical relationship between these two features gives the present claims unity of invention. Applicants respectfully request that the claims be examined as presently constituted.

#### PRE-EXAMINATION SEARCH

A pre-examination search was made in the International Phase of the present PCT prosecution, and a copy of the International Search Report is appended hereto.

#### DETAILED DISCUSSION OF RELATED REFERENCES

The following references are deemed by applicants to be most closely related to the subject matter encompassed by the claims, and copies of these references are also appended hereto.

ZNAIDI ET AL., *Materials Research Bulletin* 24:1501-1514 (1989)

Znaidi describes the production of a silver-vanadium bronze,  $\text{Ag}_{0.36}\text{V}_2\text{O}_5$ , using a sol-gel process (abstract, pp.1503-1504). In this process, a vanadium salt solution is



passed through an ion exchange resin, and is then dried to form a  $V_2O_5$  xerogel (p.1503). A thin layer of this xerogel is spread on a glass plate and immersed in a solution of  $Ag^+$  ions, resulting in an intercalated compound,  $Ag_{0.36}^+, (V_2O_5)^{0.3/0.4-}, yH_2O$ . The intercalated xerogel is thermally treated to form the resulting silver-vanadium bronze (p.1504). Znaidi mentions that the sodium-vanadium bronze produced by the comparable process is suitable for use as a reversible cathode in lithium batteries (p.1514).

In the presently claimed process, vanadium pentoxide is suspended in a liquid, together with a silver salt solution, and the resulting solution is heated. As indicated in the specification, the resulting silver-vanadium bronze exhibits structural data significantly different from that described in Znaidi, and is, therefore, a novel compound. Production of catalysts from the silver-vanadium bronze, and processes of using these catalysts are not mentioned or suggested in Znaidi.

ZHANG, ET AL., *Journal of Catalysis* 129:426-437 (1997)

Zhang discloses silver-vanadium bronze-based catalysts for conversion of toluene to benzaldehyde, including two using bronzes having BET surface areas greater than  $2 \text{ m}^2/\text{g}$  (Table 1, p.428). These two bronzes have Ag:V atomic ratios of 0 and 0.11, respectively. The catalysts disclosed in Zhang are solid material catalysts.

The present claims are drawn to catalysts having BET surface areas of from 2 to  $100 \text{ m}^2/\text{g}$  and Ag:V atomic ratios of from 0.15 to 0.95. The silver-vanadium bronzes

disclosed in Zhang do not read on this combination of elements.

The results presented in Zhang indicate that an increase in BET surface area beyond 0.64 m<sup>2</sup>/g leads to a *decrease* in selectivity for benzaldehyde (*id.*). This indicates to one of skill in the art that silver-vanadium bronzes as presently claimed would be unlikely candidates for further exploration.

#### CONCLUSION

In view of the above remarks, applicants respectfully submit that the present claims are in condition for allowance, and request that the application be passed to issuance.

Respectfully submitted,  
KEIL & WEINKAUF

A handwritten signature in black ink, appearing to read 'David C. Liechty', with a long horizontal flourish extending to the right.

David C. Liechty  
Reg. No. 48,692

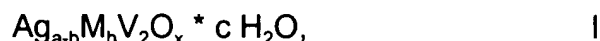
1350 Connecticut Ave., N.W.  
Washington, D.C. 20036  
(202)659-0100

DCL/kas

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

Please amend claims 1, 12-13, 20-21 and 23 to read as follows:

1. (amended) A multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

- a is from 0.3 to 1.9 and
- b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to [.]0.1 and
- c is from 0 to 20 and
- x is a number determined by the valence and amount of elements different from oxygen in the formula I,

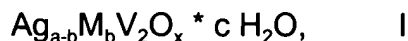
which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

12. (amended) A process [The use of multimetal oxides as claimed in claim 1] for producing precatalysts and catalysts for the gas-phase partial oxidation of aromatic hydrocarbons, comprising, in a first step, coating an inert, nonporous support material with one or more layers comprising a multimetal oxide as claimed in claim 1, in the form of a shell, and in an optional second step, thermally treating the coated support material

at a temperature of from greater than 200 to 650°C.

13. (amended) A precatalyst for producing coated catalysts for the gas-phase partial oxidation of aromatic hydrocarbons by means of a gas comprising molecular oxygen, comprising an inert, nonporous support material and one or more layers applied thereto in the form of a shell or shells, wherein this/these shell-like [this/these shell-like] layer or layers comprises/comprise a multimetal oxide as claimed in claim 1.

20. (twice amended) A coated catalyst as claimed in claim 19 which has been produced using a multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

a is from 0.3 to 1.9 and

b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to [.]0.1 and

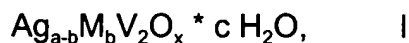
c is from 0 to 20 and

x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays

reflections at the lattice spacings  $d$  of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

21. (twice amended) A coated catalyst as claimed in claim 19 which has been produced from a precatalyst comprising an inert, nonporous support material and one or more layers applied thereto in the form of a shell or shells, wherein this/these shell-like layer or layers comprises/comprise a multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

a is from 0.3 to 1.9 and

b is from 0 to 0.5, with the proviso that the difference  $(a-b)$  is greater than or equal to  $[.]0.1$  and

c is from 0 to 20 and

x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings  $d$  of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

23. (amended) A process as claimed in claim 22, wherein use is made of a

coated catalyst whose catalytically active composition, based on its total weight, comprises from 30 to 100% by weight of a silver-vanadium oxide bronze having an Ag:V atomic ratio of from 0.15 to 0.95 and has a BET surface area of from 2 to 100 m<sup>2</sup>/g and which has been produced in situ in the oxidation reactor from a precatalyst [as claimed in claim 13] comprising an inert, nonporous support material and one or more layers applied thereto in the form of a shell or shells, wherein this/these shell-like layer or layers comprises/comprise a multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

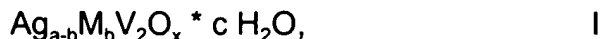
- a is from 0.3 to 1.9 and
- b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and
- c is from 0 to 20 and
- x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of 15.23 ± 0.6, 12.16 ± 0.4, 10.68 ± 0.3, 3.41 ± 0.04, 3.09 ± 0.04, 3.02 ± 0.04, 2.36 ± 0.04 and 1.80 ± 0.04 Å.

Please introduce new claims 27 to 30 as shown on the previous pages.

ALL CLAIMS

1. (amended) A multimetal oxide of the formula I

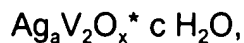


where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

- a is from 0.3 to 1.9 and
- b is from 0 to 0.5, with the proviso that the difference (a–b) is greater than or equal to 0.1 and
- c is from 0 to 20 and
- x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

- 2. A multimetal oxide as claimed in claim 1 which has a fibrous crystal morphology having a mean ratio of fiber diameter to fiber length of less than 0.6.
- 3. A multimetal oxide as claimed in claim 1 which has a specific surface area determined by the BET method of from 3 to 250 m<sup>2</sup>/g.
- 4. A multimetal oxide as claimed in claim 1 in which a is from 0.5 to 1.0, b is from 0 to 0.3 and c is from 0 to 5.
- 5. A multimetal oxide as claimed in claim 1 in which a is from 0.6 to 0.9, b is from 0 to 0.1 and c is from 0 to 1.
- 6. A multimetal oxide as claimed in claim 1 and having the formula



where a is from 0.6 to 0.9, x is as defined in claim 1 and c is from 0 to 5.

7. A multimetal oxide as claimed in claim 1 whose X-ray powder diffraction pattern displays the following 17 reflections at the specified lattice spacings d [Å]:

Reflections	d [Å]
1	15.23 ± 0.6
2	12.16 ± 0.4
3	10.68 ± 0.3
4	5.06 ± 0.06
5	4.37 ± 0.04
6	3.86 ± 0.04
7	3.41 ± 0.04
8	3.09 ± 0.04
9	3.02 ± 0.04
10	2.58 ± 0.04
11	2.48 ± 0.04
12	2.42 ± 0.04
13	2.36 ± 0.04
14	2.04 ± 0.04
15	1.93 ± 0.04
16	1.80 ± 0.04
17	1.55 ± 0.04

8. A multimetal oxide as claimed in claim 7 whose reflections 1 to 17 have the following approximate relative intensities ( $I_{\text{rel}}$  [%]):



Reflections	$I_{rel}[\%]$
1	16
2	11
3	18
4	11
5	23
6	16
7	80
8	61
9	100
10	23
11	24
12	23
13	38
14	26
15	31
16	43
17	36

9. A process for preparing multimetal oxides as claimed in claim 1, which comprises heating vanadium pentoxide suspended in a liquid with a solution of a silver salt, with or without addition of a salt of the metal M, and isolating the product.

10. A process as claimed in claim 9, wherein the liquid used is water.

11. A process as claimed in claim 9, wherein the multimetal oxide is isolated by spray drying or filtering off and drying.

12. (amended) A process for producing precatalysts and catalysts for the gas-phase partial oxidation of aromatic hydrocarbons, comprising, in a first step, coating an inert, nonporous support material with one or more layers comprising a multimetal oxide as claimed in claim 1, in the form of a shell, and in an optional second step, thermally treating the coated support material at a temperature of from greater than 200 to 650°C.

13. (amended) A precatalyst for producing coated catalysts for the gas-phase partial oxidation of aromatic hydrocarbons by means of a gas comprising molecular oxygen, comprising an inert, nonporous support material and one or more layers applied thereto in the form of a shell or shells, wherein this/these shell-like layer or layers comprises/comprise a multimetal oxide as claimed in claim 1.

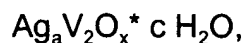
14. A precatalyst as claimed in claim 13 which comprises from 30 to 100% by weight of the multimetal oxide, based on the total weight of the layer or layers applied in the form of a shell or shells.

15. A precatalyst as claimed in claim 13 whose inert, nonporous support material comprises steatite.

16. A precatalyst as claimed in claim 13 whose shell-like layer comprises from 30 to 100% by weight, based on the total weight of this layer, of the multimetal oxide and wherein the multimetal oxide has a fibrous crystal morphology having a mean ratio of fiber diameter to fiber length of less than 0.6..

17. A precatalyst as claimed in claim 13 whose shell-like layer comprises from 30 to 100% by weight of the multimetal oxide and wherein the multimetal oxide has a specific surface area determined by the BET method of from 3 to 250 m<sup>2</sup>/g.

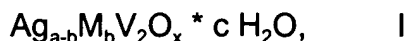
18. A precatalyst as claimed in claim 13, whose shell-like layer comprises from 30 to 100% by weight, based on the total weight of this layer, of the multimetal oxide and wherein the multimetal oxide has the formula



where a is from 0.6 to 0.9 and c is from 0 to 5.

19. A coated catalyst for the gas-phase partial oxidation of aromatic hydrocarbons by means of a gas comprising molecular oxygen, comprising a catalyst support comprising an inert, nonporous support material and, applied thereto, one or more layer or layers comprising a catalytically active composition which comprises, based on its total weight, from 30 to 100% by weight of one or more silver-vanadium oxide bronzes having an Ag : V atomic ratio of from 0.15 to 0.95 and has a BET surface area of from 2 to 100 m<sup>2</sup>/g.

20. (twice amended) A coated catalyst as claimed in claim 19 which has been produced using a multimetal oxide of the formula I

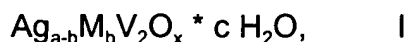


where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

- a is from 0.3 to 1.9 and
- b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and
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which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

21. (twice amended) A coated catalyst as claimed in claim 19 which has been produced from a precatalyst comprising an inert, nonporous support material and one or more layers applied thereto in the form of a shell or shells, wherein this/these shell-like layer or layers comprises/comprise a multimetal oxide of the formula I



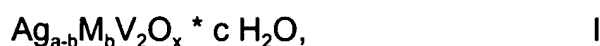
where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

- a is from 0.3 to 1.9 and
- b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and
- c is from 0 to 20 and
- x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings  $d$  of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

22. A process for preparing carboxylic acids and/or carboxylic anhydrides by partial oxidation of aromatic hydrocarbons in the gas phase by means of a gas comprising molecular oxygen at elevated temperature over a catalyst whose catalytically active composition is applied in the form of a shell to a catalyst support comprising an inert, nonporous support material, wherein the catalyst used is a coated catalyst whose catalytically active composition, based on its total weight, comprises from 30 to 100% by weight of one or more silver-vanadium oxide bronzes having an Ag:V atomic ratio of from 0.15 to 0.95 and has a BET surface area of from 2 to 100 m<sup>2</sup>/g, in the presence or absence of at least one coated catalyst for the oxidation of aromatic hydrocarbons to carboxylic acids and/or carboxylic anhydrides which is different from the above-described coated catalyst and whose catalytically active composition comprises vanadium pentoxide and anatase as significant catalytically active constituents and, if such a second coated catalyst is present, it is used in a combined catalyst bed with the coated catalyst of the above composition in the oxidation reactor.

23. (amended) A process as claimed in claim 22, wherein use is made of a coated catalyst whose catalytically active composition, based on its total weight, comprises from 30 to 100% by weight of a silver-vanadium oxide bronze having an Ag:V atomic ratio of from 0.15 to 0.95 and has a BET surface area of from 2 to 100 m<sup>2</sup>/g and which has been produced in situ in the oxidation reactor from a precatalyst comprising an inert, nonporous support material and one or more layers applied thereto in the form of a shell or shells, wherein this/these shell-like layer or layers comprises/comprise a multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

- a is from 0.3 to 1.9 and
- b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and
- c is from 0 to 20 and
- x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

24. A process as claimed in claim 22, wherein the coated catalyst used in a first catalyst bed located toward the gas inlet end of the oxidation reactor is a coated catalyst whose catalytically active composition comprises, based on its total weight, from 30 to 100% by weight of a silver-vanadium oxide bronze having an Ag:V atomic ratio of from 0.15 to 0.95 and has a BET surface area of from 2 to 100 m<sup>2</sup>/g and the coated catalyst used in a subsequent catalyst bed located toward the gas outlet end of the oxidation reactor is a coated catalyst for the oxidation of aromatic hydrocarbons to

carboxylic acids and/or carboxylic anhydrides whose catalytically active composition comprises vanadium pentoxide and anatase as significant constituents.

25. A process as claimed in claim 22, wherein, as aromatic hydrocarbons, o-xylene or naphthalene or mixtures of o-xylene and naphthalene are oxidized to phthalic anhydride.

26. A process as claimed in claim 22, wherein, as aromatic hydrocarbon, toluene is oxidized to benzoic acid.

27. (newly added) A process as claimed in claim 22, wherein the first coated catalyst has been produced using a multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

a is from 0.3 to 1.9 and

b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and

c is from 0 to 20 and

x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

28. (newly added) A process as claimed in claim 24, wherein the coated catalyst used in the first catalyst bed has been produced using a multimetal oxide of the formula I



where M is a metal selected from the group consisting of Li, Na, K, Rb, Cs, Tl, Mg, Ca, Sr, Ba, Cu, Zn, Cd, Pb, Cr, Au, Al, Fe, Co, Ni and/or Mo,

- a is from 0.3 to 1.9 and
- b is from 0 to 0.5, with the proviso that the difference (a-b) is greater than or equal to 0.1 and
- c is from 0 to 20 and
- x is a number determined by the valence and amount of elements different from oxygen in the formula I,

which has a crystal structure giving an X-ray powder diffraction pattern which displays reflections at the lattice spacings d of  $15.23 \pm 0.6$ ,  $12.16 \pm 0.4$ ,  $10.68 \pm 0.3$ ,  $3.41 \pm 0.04$ ,  $3.09 \pm 0.04$ ,  $3.02 \pm 0.04$ ,  $2.36 \pm 0.04$  and  $1.80 \pm 0.04$  Å.

29. (newly added) A process as claimed in claim 27, wherein, as aromatic hydrocarbons, o-xylene or naphthalene or mixtures of o-xylene and naphthalene are oxidized to phthalic anhydride.

30. (newly added) A process as claimed in claim 27, wherein, as aromatic hydrocarbon, toluene is oxidized to benzoic acid.